

USDA/APHIS/WILDLIFE SERVICES

RESEARCH NEEDS ASSESSMENT

2001



Richard Bruggers, Team Leader (WS/National Wildlife Research Center)

4101 LaPorte Avenue

Fort Collins, CO 80521-2154

and

Richard Owens (WS/Eastern Region Office)

Thomas Hoffman (WS/Western Region Office)

August 30, 2001

INDEX

Research Needs Assessment Report	Pages 1-5
Reassessment of WS Research Needs (NWRC Director memo)	Appendix I
WS Research Needs Assessment (WS Deputy Administrator memo to WS Program)	Appendix II
WS Research Needs Assessment (NWRC Director memo to WSNAC)	Appendix III
Compilation of 2001 Research Needs Assessment Survey	Appendix IV
Current APHIS/WS Methods Development Research	Appendix V

**Research Needs Assessment
USDA/Wildlife Services Program
Methods Development**

August 30, 2001

BACKGROUND

In 1989, APHIS identified the need to assess the national research needs of the Wildlife Service (WS) Program. A survey of all WS State Directors resulted in a list of research needs and their relative priorities, based on species and affected resource groups. This assessment was later published by Packham and Connolly (1992)¹. At that time, the WS/Management Team also decided that these assessments of national research needs would be conducted about every five years. In 1991, the Program also convened an "Expert Panel" of stakeholders in science, industry, agriculture, and the environment in Denver, Colorado, to identify research approaches to address the wildlife damage problems and needs identified in the 1989 survey. In 1996, another WS program-wide Research Needs Assessment was completed. These 1989, 1991, and 1996 events still guide the WS Methods Development research planning, and these identified research needs have been used by the National Wildlife Research Center (NWRC) Director as principal guidance, along with Congressional Directives and Deputy Administrator guidance, with input from external sources and stakeholder groups, in allocating NWRC resources to specific research projects that address the WS Program's priority research needs.

In 1996, the NWRC completed two additional initiatives to further improve and strengthen its research agenda and better align it with WS program and customer needs. First, all of the Center's existing research was reorganized into individual multiyear, multidisciplinary projects, which address specific areas of research related to research priorities identified in the RNA process. These projects are of 3-5 years in duration, have clearly stated goals and objectives, projected milestones, expected outputs, periodic reviews, and annual progress updates. Second, to further emphasize research, the Center realigned these research projects under three Research Program Managers for bird, mammal, and product development research, and also reassigned a number of individuals from support units into research units.

Five years have now passed since the 1996 survey, and another survey has been completed to assess the current and future research needs identified by WS State Directors, NWRC scientists, and members of the National Wildlife Services Advisory Committee (NWSAC) to the US Secretary of Agriculture. This report lists the submitted research needs and a prioritization of those considered most important to the eastern and western regions, the NWRC, and the Program as a whole.

¹ Packham, C.J. and G. Connolly. 1992. Control Methods Research Priorities for Animal Damage Control. Proc. 15th Vertebrate Pest Conf. (J.E. Borrecco and R.E. Marsch, eds.) Pg. 12-15. University of California.

SURVEY AND PRIORITIZATION PROCESS

The APHIS/Wildlife Services (WS) Program has established a means of identifying and prioritizing wildlife conflicts and risks needing research attention through the use of a WS Research Needs Assessment (RNA) process conducted every five years. In this process, WS operational personnel from the state offices of the Eastern and Western Regions, as well as researchers from the National Wildlife Research Center (NWRC) are surveyed to identify the most important research needs. Previous assessments were conducted in 1989 and 1996; the most current RNA was completed in August 2001. These identified research needs are used by the WS/NWRC Director as principal guidance, along with Congressional Directives and Deputy Administrator guidance, in allocating NWRC resources to specific research projects that address the WS Program's priority research needs. Additionally, members of the National Wildlife Services Advisory Committee (NWSAC) requested the opportunity to be involved in the WS program's 2001 RNA process, and the members of the most current NWSAC were invited by the NWRC Director to provide input to the RNA survey.

On February 8, 2001, the NWRC Director set the 2001 RNA in place (Appendix I). On February 26, 2001 and April 20, 2001, the WS Deputy Administrator (Appendix II) and NWRC Director (Appendix III), respectively, solicited from WS State Directors, NWRC scientists, and NWSAC members, their three (in most cases) most important research needs. By May 25th, the NWRC Director had received 188 submissions from 26 State Directors (12 Eastern and 14 Western) representing 36 states, 23 NWRC scientists, and 6 NWSAC members. Each of the 188 needs was rewritten into a standard format and duplicate submissions were eliminated, reducing the input to 103 different needs. To arrive at a shorter list that still reflected relative priorities of the Program, duplicate needs were eliminated, reducing the input to 103 different needs. These were then grouped by research related to birds and mammals, affected resource, threatened and endangered species, wildlife disease, wildlife population-models/census/economics, chemical products/registration, and documentation/information (Appendix IV). NWRC does not have the resources to address all these listed needs of the WS program. Therefore, each member of the RNA team, with input from his respective office (WRO, ERO, and NWRC), then further prioritized those research needs. Prioritization criteria included:

- The extent of past research efforts versus the need for new research directions
- The need for immediate versus future information, methods and/or solutions
- The current availability of existing information, methods and/or solutions that simply need refinement versus the need for new information, methods and/or solutions
- The perceived value and/or magnitude of the resources impacted, damaged, or lost
- The state, regional, or national importance
- The perceived importance to stakeholders

Table 1 represents an unordered compilation of high priority research areas to the WS Program with specific examples listed individually or grouped. In general, the principal research needs identified in this 2001 survey were predominantly related to understanding and finding solutions to resolve (a) bird damage to agriculture and aquaculture, (b) waterfowl, goose, and vulture impacts in urban/suburban situations, (c) wildlife problems at airports, (d) predation impacts on

livestock, other wildlife, and human health and safety, (e) mammal damage to forest, riverine, and agriculture resources, (f) wildlife disease transmission, (g) invasive species, and (h) census methods for management of overabundant species. In addition, the WS Program's need to better understand the economics of damage by a variety of species, to develop and register new chemical products, and to improve information dissemination were clear.

A few clarifications to the list in Table 1 are needed. First, only research to be funded by Congressional appropriation to APHIS/WS has been included in this priority list. Therefore, research needs identified for Brown Treesnakes conducted with external funds, are not specified. Second, needs are not categorized under a product development research category, one of NWRC's three research programs, as specific needs were considered to be adequately encompassed under bird and mammal research categories. However, within the context of bird and mammal research, product development research is clearly required for problem resolution for certain species in particular situations. For example, identified products focused on contraceptives, sterilants, and vaccines, non-lethal repellents such as methyl anthranilate, DRC-1339, M44 registration for use in protecting natural resources, alternative rodenticides, odor and taste attractants, live traps, remote trap monitors, and pan tension devices. Of particular note is the recognition that NWRC should increase emphasis on non-chemical product development. Third, a number of the priority research areas to the WS Program expressed in this 2001 RNA are very similar to those identified in the 1996 RNA. Consequently, in 2001, the NWRC already has in place several projects that will immediately address the results of this 2001 prioritization process. NWRC's current research projects are summarized in Appendix V. Fourth, the eight identified documentation needs (cited in Appendix IV) were considered very important, and will be addressed directly by the Center and its Information Services Unit and by working with APHIS Legislative and Public Affairs and outside cooperators.

TABLE 1. Highest priority research issues determined from 103 specific identified needs in the 2001 Research Needs Assessment conducted by the APHIS/WS Program

BIRDS



- Improve existing and investigate new methods to protect agricultural crops (for example: sunflower, sprouting and ripening rice) from blackbird damage

More specifically, needs were identified related to developing non-lethal techniques (for example: repellents, frightening devices, barrier, habitat management, and reproductive inhibitors); improving lethal chemical tools (for example: improve baiting strategy and enhance acceptability of DRC 1339-Starlicide); and developing methods to estimate mortality or "take" of blackbirds during operational use of these tools for blackbird damage control in sunflowers and rice.

- Conduct research on the impacts of fish-eating birds (primarily double-crested cormorants and American white pelicans) to the aquaculture and sport fish industries

More specifically, needs were identified related to understanding cormorant depredation and impacts to sport fisheries (for example: crappie, bass, and walleye) the crawfish industry, and other natural resources (for example: roosting vegetation), and American white pelican impacts on sport fisheries, their local movement patterns in commercial aquaculture areas relative to both damage and transmission of catfish diseases; and developing new, non-lethal methods (for example: repellents, behavior contingent disruptive stimuli) to reduce their adverse impacts to commercial and sport fishery production

- Investigate hazards, solutions, and strategies to resolve bird and other wildlife problems at airports

More specifically, needs were identified related to continuing investigations of non-lethal methods, specifically habitat management techniques, and initiating new investigations of non-traditional ecosystems, such as desert environments, as they relate to wildlife-aviation strike hazards

- Investigate the roosting preference, behavior, and dispersal techniques for crows and ravens in urban/suburban environments
- Investigate and develop new and improve existing tools and strategies to resolve the impacts of geese, gulls, and terns in a variety of urban/suburban situations

More specifically, needs were identified related to developing efficient, long lasting damage management techniques (for example: barriers, harassment and hazing methods, contraceptives, Avitrol, egg removal, and repellents), and addressing issues related to geese and human health and safety (for example: potential disease transmission), gulls and urban property damage (for example: using rooftops and landfills), and terns and natural resource impacts (for example: predating salmon smolt)

- Conduct research into understanding the problems and developing methods (for example: harassment, taste repellents, toxicants) to reduce the negative impact of black vultures and turkey vultures on livestock production and property (for example: homes, watercraft, and communication towers)

MAMMALS



- Develop methods to protect timber and forest resources from wildlife damage

More specifically, needs were identified related to evaluating existing and identifying new repellents and barriers, and assessing the economic implications of various mitigation methods and strategies

- Conduct research to understand and resolve the impact of beavers on aquatic ecosystems

More specifically, needs were identified related to developing methods to census local beaver populations, describe and quantify their economic impacts, and evaluating existing (for example: repellents, barriers, lures, and toxicants) and alternative (for example: relocation) management practices to reduce their damage to forest, agriculture, urban/suburban, and riverine environments

- Evaluate and develop tools and techniques for use in integrated pest management strategies for rodents in both agricultural and native habitat ecosystems

More specifically, needs were identified related to evaluating ecologically sound and economically feasible methods (for example: repellents, barriers, toxicants, odor and taste attractants, micro-encapsulation methods) to reduce negative impacts of prairie dogs, rats, pocket gophers, and ground squirrels

- Conduct behavioral and techniques development research for canids as related to developing effective predation damage management programs for livestock in agricultural situations and for protecting human health and safety in urban/suburban situations

More specifically, needs were identified related to improving existing and developing new alternative tools, using state-of-the-art technologies (for example: improved capture devices such as snares and live traps, reproductive inhibition techniques, vaccines and associated delivery systems, as well as selective attractants and repellents) for primarily coyotes, cougars, and bears in agricultural settings, and coyotes and fox in urban/suburban settings

- Examine the growing and expanding negative impact of predators (for example: coyotes, foxes, wolves, and raccoons) on wildlife resources (for example: deer and antelope), including, but not limited to threatened and endangered species (for example: sage grouse, turtles, terns, and rails)

More specifically, needs were identified related to evaluating existing and developing new, effective predation damage management tools and strategies for use in these expanding, predator-wildlife conflict situations

WILDLIFE DISEASES AND POPULATION MONITORING



- Develop methods to survey and monitor emerging wildlife diseases and reduce the risks of the transmission of those that pose a threat to human health and safety and livestock production

More specifically, needs were identified related to understanding the demography, movements and behavior of raccoons and foxes as related to oral rabies vaccination programs, and deer and cattle as related to bovine tuberculosis transmission; and developing methods (for example: barriers, reproductive inhibitors, and vaccines) to reduce the risk of disease transmission.

- Develop methods to better monitor problem wildlife species populations as related to their economic impact, management effectiveness, and environmental mandates (for example: NEPA requirements)

More specifically, needs were identified related to improving and/or developing practical methods to census overabundant wildlife populations, assess damage, determine "take" and quantify the effectiveness of management strategies (for example: non lethal vs lethal methods), with particular emphasis placed on those species most often addressed by the WS program (for example: coyotes, blackbirds, and beavers)



United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Wildlife
Services

National Wildlife Research Center
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
Telephone: 970/266-6036
Fax: 970/266-6040

Subject: Reassessment of WS Research Needs

Date: February 8, 2001

To: Richard Bruggers
Assistant Director

The Wildlife Services (WS) Program conducts a nationwide assessment of its research needs every five years. The results are used by the National Wildlife Research Center (NWRC) as principal guidance, in addition to Congressional budget language, for research project planning and resource allocations. Fiscal year 2001 begins a new five-year cycle of research needs. Once again I would like you to provide WS and Center leadership and coordination for this task.

The WS Management Team agreed on January 30, 2001, to the recommendation of using a process similar to that used for the 1996 assessment, with NWRC providing the leadership, and each Region and OSS assigning a representative to work with you. I will ask the other Directors to designate a person to work with you. The goal is to conduct an assessment of WS research needs and their relative priorities, not to prioritize current research which is based largely on priorities of the 1966 assessment. It is important to finish with a product that represents the broad spectrum and relative priorities of wildlife damage problems faced by the Program, its cooperators and stakeholders. The group you will lead should first decide on the process to efficiently reassess and prioritize research needs, and second, identify who (State Directors, Research Program Managers, research scientists) is responsible for implementing the various steps or phases of the process. The NWRC will provide the staff support to carry out the administrative aspects of the process - letters, memos, data compilation and analysis, and report writing. The target for completing the reassessment document is August 30, 2001.

Richard D. Curnow
Director

cc: Bill Clay, WS Deputy Administrator

Appendix I





United States
Department of
Agriculture

FEB 26 2001

Marketing and
Regulatory
Programs

Subject: WS Research Needs Assessment - 2001

To: See Distribution

Animal and
Plant Health
Inspection
Service

Washington, DC
20250

Research and methods development priorities of Wildlife Services (WS) are established largely through the WS Research Needs Assessment (RNA) process conducted every five years. The present WS/National Wildlife Research Center (NWRC) research program is based on prior needs assessments, Congressional mandates, and WS Deputy Administrator and Management Team decisions. The WS Management Team, in its January 2001 management team meeting, reaffirmed the value of updating the RNA during FY01, and identified individuals from both operations and research to implement this process and to analyze and summarize responses.

By this memorandum, I am soliciting your input for research that you would like to see conducted by NWRC to better resolve existing and emerging issues faced by the WS Program. Please take this opportunity to identify the three most important research needs in priority order in your State or Region. For each, provide (1) a brief statement of damage problems or situations and include species/ species groups and resources affected; (2) background on the magnitude and/or location of the problem (state, regional, national) and other pertinent information; and (3) the importance of research in this area. I also have asked the Operational Support Staff to analyze relevant data generated by the MIS to further assist this effort. A summary of the results of the 1996 RNA is attached. *Your input should be provided to the Director, National Wildlife Research Center, 4101 LaPorte Avenue, Fort Collins, CO 80521 by March 30, 2001.*

The NWRC has a very effective research project management system in place to address WS program and stakeholder research needs. The Center's research is organized into multi year projects of 3-5 years duration. These projects have concise goals, clearly defined objectives, periodic reviews, and expected outputs by which research can be initiated and progress measured. This 2001 RNA will be another important step to assure that the WS program directs its research efforts to provide solutions to present and future problems. Every effort will be made to include these newly identified needs into the NWRC's research projects over the next five years. I strongly encourage you to participate in this assessment.

William H. Clay
Deputy Administrator
Wildlife Services

Encl



APHIS - Protecting American Agriculture
An Equal Opportunity Employer

Appendix II

Director, NWRC, et.al

Page 2

DISTRIBUTION:

Director, NWRC, Fort Collins, CO
Director, Eastern Regional Office, Raleigh, NC
Director, Western Regional Office, Lakewood, CO
State Directors
Research Program Managers
Field Station Leaders



United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

Wildlife
Services

National Wildlife Research Center
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
Telephone: 970/266-6036
Fax: 970/266-6040

April 20, 2001

THIS LETTER WAS MAILED TO CURRENT NWSAC MEMBERS

The USDA/Wildlife Services (WS) program is conducting a national assessment of the most important wildlife damage and conflict situations faced by its State Directors and research scientists to better understand the current and future research needs faced by the WS Program and its stakeholders. The 2001 assessment is the third such Research Needs Assessment (RNA) that has been conducted since the WS program's move from the Department of Interior into the Department of Agriculture. The results of these assessments provide guidance around which the program's National Wildlife Research Center (NWRC) develops its research agenda.

During the June, 2000 National Wildlife Services Advisory Committee (NWSAC) meeting, committee members expressed an interest in being given an opportunity for input into this 2001 RNA. As a result, I am attaching the WS Deputy Administrator's solicitation letter to the WS program and guidance, along with a list of the priority research needs identified from the 1996 RNA, many of which are currently being addressed by NWRC. Please use the guidance in Mr. Clay's letter and provide any input you may have directly to me by May 11, 2001. Every effort will be made to include your needs in the Center's research project management process as opportunities and funding permit. A summary report will be provided to you at the end of this process. Thank you in advance for your input.

Sincerely,

Richard D. Curnow
Director

cc: Mr. William Clay, WS/DA

Encl

Appendix III



APHIS- Protecting American Agriculture

An Equal Opportunity Employer

Summary of research needs as identified by WS Eastern and Western Region State Directors, NWRC scientists, and the National Wildlife Services Advisory Committee-2001

Bird Research

Aquaculture

- Determine the populations and impacts of double-crested cormorants and pelicans on sport fish and other natural resources.
- Implement a strategy for controlling double-crested cormorant populations on breeding grounds to minimize damage to the aquaculture industry.
- Clarify the local movements of American White Pelicans in and around aquaculture facilities as related to their possible transmission of catfish diseases.
- Determine the economic impact and investigate methods to protect freshwater and marine aquaculture from fish eating birds.
- Develop methods to test behavior-contingent disruptive stimulus devices on birds, primarily in aquaculture or crop depredation situations.

Aviation

- Continue to work on solutions to bird and other wildlife problems at airports.
- Continue investigating and developing nonlethal methods (e.g., habitat management techniques and recommendations) to reduce wildlife hazards at airports nationwide.
- Maintain and expand the National Wildlife Strike Database (NWSD).
- Evaluate desert environments as they pertain to wildlife-aviation strike hazards.

Blackbirds/Corvids (crows and ravens)

- Develop new/improve existing methods (e.g., repellents, toxicants, Avitrol, pyrotechnics, harassment, barriers, reproductive inhibition) to mitigate the impact of blackbird, crow, and starling damage to sunflowers, sprouting and ripening rice and corn, other small grain crops, and fruit crops.
- Develop methods to estimate the mortality of blackbirds during operational use of chemical control methods.
- Better understand the roosting preferences and behaviors of urban crows and investigate and develop aversive methods to manage urban/suburban bird roosts involving crows, starlings, grackles, pigeons, cowbirds and blackbirds.
- Develop repellents for ravens and crows.

Waterfowl/Gulls/Terns

- Evaluate the effectiveness of existing and new tools (e.g., lasers, collies, and habitat management) for waterfowl (i.e., geese and ducks) and develop other more efficient, long lasting methods to address issues associated with human health and safety, agriculture, urban property (landscapes, rooftops and landfills), and natural resources (shoreline erosion from overgrazing).
- Determine the severity of and develop methods to reduce the impacts to winter wheat and other crops by grazing waterfowl, especially Canada geese.
- Evaluate the effectiveness of relocating urban/suburban Canada geese and determine their survival and return rate.
- Develop and evaluate methods to manage gull and tern populations causing problems to endangered salmon species at hydroelectric structures.

Other Birds/Situations

- Evaluate repellents for parrots and cardinals in seed corn on Hawaii/Pacific Islands.
- Develop methods to manage damage by birds to vineyards.
- Develop tools to manage woodpecker damage to structures, utility poles, and citrus, and raven damage to citrus.
- Develop methods (e.g., lasers and infrared technologies) to reduce eagle predation on livestock.
- Continue to develop methods to disperse black and turkey vulture roosts and manage their damage to livestock, property, communication towers, homes, and water craft.
- Develop a decision model as a tool to decide if depopulating vulture roosts is economically feasible.

- Increase activities related to the protection of neotropical songbirds from competition with blackbirds and other overabundant and nuisance wild and feral domestic animals.
- Conduct applied research that investigates the important factors influencing aversions (e.g., flavors and social facilitation) on birds.
- Evaluate the impact on birds of chemicals used for insect control

Mammal Research

Aquatic Mammals

- Evaluate beaver populations and develop existing (e.g., repellents, barriers) and alternative (e.g., relocation) management practices to reduce their damage to timber, crops, roadways, railroads, housing developments nationwide.
- Determine the role of beaver populations in salmon ecology and develop management methods.
- Conduct research to identify, evaluate, and improve the methods, materials and devices needed to reduce and monitor nutria and muskrat damage to marsh ecosystems and agriculture, including developing ecologically sound and cost effective integrated management strategies.

Forest Resources

- Continue to develop alternative methods and strategies to protect timber and forest resources from wildlife damage nationwide.
- Determine whether bear damage to timber is a learned behavior or an evolutionary trait.
- Improve technology used in non lethal wildlife relocation efforts (e.g., bears) related to method of capture and transport, distance, time-of-day, habitat, and territorial insertion.
- Develop effective, environmentally safe toxicants and delivery systems for forest mammal damage management

Predators (Livestock)

- Develop predator management programs that include state-of-the-art technology and cutting edge science.
- Assess strategies and programs and develop methods to manage coyote predation on livestock.
- Evaluate sheep losses to coyotes in areas with and without operational control.
- Develop both non lethal and lethal tools to selectively target and remove specific predators whose territories overlap sheep pastures in an economic, efficient, and humane manner.
- Develop lethal or non lethal control methods that are effective against territorial, dominant coyotes (alphas) who have previously been exposed to control.
- Continue to develop alternative predator capture devices, with a focus on decreasing injury rates.
- Develop new, effective, non-lethal capture techniques and management strategies for predators (e.g., coyotes, wolves, fox, bear and mountain lions).
- Re-evaluate the capture efficiency and non-target impacts of the foothold traps and snares currently being used to capture coyotes, foxes, and raccoons.
- Develop new technologies to address 24 hour trap check requirements
- Develop live traps for larger mammals such as coyotes, lions, and bobcats.
- Develop techniques for remote triggering of coyote calling devices.
- Develop new predator management tools to replace traps and toxicants on public lands.
- Evaluate damage management methods for established wolf populations.
- Determine the population dynamics of expanding cougar populations.

Rodents

- Continue development of tools and techniques for use in integrated pest management strategies for ground squirrels, prairie dogs, pocket gophers, voles, and deer mice.
- Develop toxicants, chemical and physical repellents to prevent gnawing, contamination, structural damage, and crop/food loss damage by rodents.
- Develop and refine ecologically sound and cost-effective techniques for rodent control in agriculture and native ecosystems in Hawaii and islands in the Pacific, Indian, and Caribbean Oceans.

Other Mammals/Situations

- Conduct applied research that investigates plant-herbivore interactions, that is the natural defenses of plants to wildlife.
- Develop non lethal methods to reduce ungulate deer and elk damage in agricultural and urban landscapes.
- Conduct research to determine the population, range, density of the nine-banded armadillo in Florida, quantify their ecological and economic impacts and identify, evaluate, and improve methods to reduce its damage to ecosystems and agriculture.
- Conduct research to determine the population size, range, density of wild pigs throughout their range in the US, quantify their ecological/economic impacts, evaluate, and improve the methods to reduce and monitor pig damage to ecosystems and agriculture.

Threatened and Endangered Species

- Develop methods to detect and manage the impact of mammalian predators on T&E wildlife species, specifically red fox predation on rails and terns, and rat, feral cat and island fox predation on shrikes.
- Examine the growing conflict and develop basic and applied strategies to reduce mammalian predation on threatened and endangered species.
- Develop new, effective and efficient methods and assess management strategies to reduce risks that predators (e.g., coyotes, wolves) pose to threatened and endangered species.
- Determine the indirect benefits to pronghorn fawn survival rates of predator management programs.
- Evaluate all impacts, including the incidental or coordinated beneficial impacts on native prey, from the use of integrated wildlife damage management techniques.

Invasive Species

- Begin to document the extent of invasive vertebrate species nationwide, beginning within each state, and initiate research into invasive species management in the U.S.
- Develop options for managing invasive and exotic species problems in the U.S.
- Develop and refine control techniques for the Brown Treesnake on Guam, including effective aerial bait delivery systems and artificial attractants.
- Evaluate the efficiency of canines to detect Brown Treesnakes under the current passive detection protocol on Guam.
- Develop methods to monitor and control introduced vertebrate species that have impacted Hawaiian agriculture and natural resources, including tree frogs, parrots, axis deer and small predators.
- Develop crab/pig resistant bait stations for anticoagulant use on rats and mongoose in island environments.

Chemical Products and Registration

- Continue to assure use and improvement of existing tools and chemical products.
- Develop an alternative chemical and delivery system to the M-44.
- Evaluate registration of M-44 for protection of natural resources (mammalian and avian).
- Develop odor and taste attractants to improve rodenticide, avicide, and contraceptive baiting efficacy, safety and selectivity toward target species.
- Evaluate registration of DRC-1339 for use in protecting bee boards from corvids (magpies, crows, ravens).
- Develop a replacement avicide for DRC-1339.
- Determine the adsorption, distribution, metabolism, and excretion of alpha chloralose in target pest bird species related to the 30 day FDA-imposed hunting moratorium on its use.
- Conduct research to develop more bird repellent and toxicant registrations.
- Develop effective microencapsulation techniques for rodenticides.
- Develop a more effective tranquilizer trap device for expanded widespread use to include wolves and feral dogs.
- Develop effective baits to live trap armadillos in urban areas.
- Develop an improved bait for use in removing starlings and blackbirds from feedlots, dairies, and staging areas.
- Identify and evaluate alternative products, such as repellents, attractants, and/or animal drugs for possible registration with EPA and FDA.

- Develop new ways to formulate and deliver products more efficiently for use by wildlife damage managers.
- Develop a nontoxic, cost-effective blackbird repellent for protecting rice crops.
- Explore and develop genetic plant and prey species alteration as a means of reducing the attractiveness of crop and livestock resources to problem wildlife
- Register ROZOL grain-bait for prairie dog control

Wildlife Disease

- Evaluate the significance of and develop methods to reduce the risk of disease transmission by crows, starlings, geese, and other avian wildlife to humans and livestock.
- Determine the impact of and develop methods to reduce human health and safety impacts caused by waterfowl, especially Canada geese, in urban/suburban areas.
- Increase research on reproductive inhibitors and oral vaccines for wildlife disease control.
- Evaluate the relevant aspects of demography, behavior, and movements of raccoons as they relate to oral rabies vaccination programs.
- Develop methods to manage the impact of rabies and other diseases transmissible from wildlife to humans.
- Obtain information on gray fox home range and population dynamics to develop improved oral rabies vaccine baiting strategies.
- Develop methods to survey and monitor emerging wildlife diseases that pose potential threats to human health and safety.

Wildlife Population - models/census/economics

- Continue research on impacts and efficacy of predator control, including cost:benefit analyses and intra- and inter-species impacts nationwide.
- Continue to develop methods to census wildlife populations (e.g., coyotes, foxes, feral hogs, armadillos, and raccoons) related to increased ability to implement and improve control programs to protect threatened and endangered species.
- Develop a standardized survey to assess the distribution, magnitude, and characteristics of wildlife damage problems associated with urban/suburban areas.
- Develop methods to census and investigate populations of problem wildlife species (e.g., coyote, beaver, bear, mountain lions, blackbirds, gulls, cormorants, and geese) related to management and NEPA requirements.
- Develop methods to monitor pest wildlife populations related to economic impacts, management effectiveness, and environmental concerns
- Develop methods that the WS program can use to report the estimated "take" associated with different damage control measures.
- Develop quantitative and economic evaluations of current applied wildlife damage methods and tools (e.g., aerial hunting) under operational circumstances.
- Develop a better understanding of population dynamics and economic impact of the primary species to which WS directs its operational programs.
- Devise computer-based techniques to evaluate the costs:benefits of preventative and corrective approaches, tools, and activities associated with the species most frequently managed by WS and its stakeholders.
- Develop bioenergetic models to estimate economic impacts of blackbirds and other overabundant and nuisance species relative to cost:benefit analyses, management programs, and environmental issues.
- Improve the understanding of carnivore depredations through modeling and develop new and modified management strategies.
- Develop genetic markers for use in censusing populations and identifying individual animals for improved management of pest wildlife.
- Conduct economic analyses of the 1) value of wildlife to non-consumptive users, 2) livestock losses vs control implementation by WS operations, 3) impacts of lethal control on ecosystem health and integrity, and 4) aerial gunning program of WS operations.

Documentation/Information

- Index APHIS/WS/NWRC website to "hit" for searching by species (e.g. coyotes, gulls, etc.)
- Assemble a product-specific database of commercial wildlife repellents, with relevant research citations, as an aid to wildlife managers nationwide.
- Conduct human dimension research to assess the impact of wildlife damage management programs on the public.
- Evaluate public attitudes toward Wildlife Services and study the effects of the WS national education program on attitudes towards wildlife-human conflicts.
- Assess potential wildlife "growth" areas to determine the need and extent of emerging wildlife damage issues.
- Document calf losses to natural causes versus coyote predation.
- Document the benefits of predator control to enhance wildlife populations.
- Communicate new research developments more effectively, by improving technical and educational outreach program and information transfer between research and operations.

Current NWRC Projects with Goals and Objectives – August 22, 2001

Project Title Project Leader	Start Date Projected Completion	Goal	Objectives
Bird Research			
Defining and Reducing Wildlife Hazards to Aviation			
<i>Richard Dolbeer</i>	10/1/99	Provide a scientific foundation for Wildlife Services programs at airports throughout the USA to reduce wildlife hazards to the aviation industry.	<ul style="list-style-type: none"> • Wildlife habitat management and other land-use studies at airports. • Development and management of the FAA National Wildlife Strike Database. • Development and evaluation of methods to control wildlife damage for airports. • Development of a Wildlife Hazard Management Manual for Airport Operators.
	9/30/04		

Development and Evaluation of Management Techniques for Reducing Blackbird Damage to Ripening Sunflower Crops and to Feedlots			
<i>George M. Linz</i>	10/1/99	Develop new and/or improved methods to reduce blackbird damage to ripening sunflower crops and to feedlots.	<ul style="list-style-type: none"> • Improve the use of DRC-1339 to reduce blackbird populations responsible for damaging sunflower crops and eating livestock feed. • Determine the nontarget avian risks of using DRC-1339 treated rice for reducing blackbird populations in the Great Plains and develop risk quotients from existing database of LD50's for nontarget avian species of interest. • Improve the cost-effectiveness of glyphosate herbicide applications for managing dense cattail stands used by roosting blackbird populations during late-summer. • Develop population models describing the population distribution, abundance and dynamics of blackbirds in central North America. • Quantitatively determine the effects on reproduction of blackbirds and nontarget birds of systematically removing territorial male blackbirds and thus disrupting blackbird pair-bonding. • Identify, develop, and improve the use of chemical repellents and physical barriers for reducing blackbird damage to ripening sunflower crops. • Obtain current blackbird population data and levels of crop damage in sunflower growing areas. • Develop a comprehensive database on the basic ecology and regional movements of blackbirds in relation to sunflower and livestock feed damage.
	9/30/04		

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Development of Methods to Manage Depredation and Nuisance Problems Caused by Vultures <i>Mike Avery</i>	 10/1/99 9/30/02	Understand the relationships between various habitat and land use variables and problems caused by vultures and develop effective management techniques for reducing predation losses and property damage.	<ul style="list-style-type: none"> • Evaluate management methods at vulture roosts. • Determine why vultures damage vinyl, plastic, and other synthetic construction and insulation materials and evaluate possible deterrents to such behavior. • Understand broad-scale vulture movement patterns and resource use, with particular attention to livestock, landfills and airports. • Develop a set of recommended management practices for reducing depredation and nuisance problems caused by vultures.

Economic Impact and Management of Bird Predation at Aquaculture Facilities in the Southeastern United States <i>Scott Werner</i>	 10/1/99 9/30/04	Determine the magnitude of and develop methodology to reduce damage by cormorants, wading birds and pelicans on southern catfish, baitfish and crawfish farms.	<ul style="list-style-type: none"> • Determine population trends of double-crested cormorants, delineate large-scale movements, and construct models that describe population dynamics and predict the effect of various management strategies. • Determine the biology and impact of various piscivorous birds on catfish, baitfish and crawfish industries. • Develop nonlethal methods (fish culturing practices, physical barriers, lasers and automated frightening devices) for reducing cormorant an other bird damage to aquaculture. • Determine the potential for piscivorous birds to serve as vectors for fish diseases and parasites.
--	----------------------------	--	--

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Management of Bird Damage to Rice <i>John Cummings</i>	 10/1/99 9/30/04	Develop new or improved management strategies for reducing bird damage to rice.	<ul style="list-style-type: none"> Determine the current population status of blackbirds in rice-growing regions of the U.S. and development of a population management plan for blackbirds for the major rice-growing regions (e.g., LA, AK, TX) of the U.S. Determine the current economic impact of blackbirds on the rice industry. Identify, develop and evaluate chemical repellents for reducing bird damage to newly-planted and ripening rice. Determine the efficacy of the Wildlife Services blackbird/DRC-1339 baiting program in LA and TX; improve DRC-1339 bait formulations and bait application techniques; and determine associated non-target hazards. Develop and evaluate new or improved and/or tools to manage blackbird damage to newly-planted and ripening rice. Production of a guide for rice producers to use to effectively reduce blackbird damage to rice.
Waterfowl as Disease, Parasite, and Noxious Weed Reservoirs in Urban and Agricultural Landscapes <i>Larry Clark</i>	 10/1/99 9/30/04	Understand and develop management recommendations related to the contribution and impact of Canada geese as vectors for disease, parasites and noxious weeds on human health and safety in urban landscapes and on animal health in agricultural landscapes.	<ul style="list-style-type: none"> Determine the prevalence of <i>Salmonella</i> spp., <i>Campylobacter</i> spp., and <i>Escheri coli</i> H:0157 from Canada goose feces derived from urban landscapes and make recommendations for managing associated risks to human health and safety. Determine the prevalence of <i>Salmonella</i> spp., <i>Campylobacter</i> spp., and <i>Escheri coli</i> H:0157 from Canada goose feces derived from agricultural pastures. Determine the prevalence of other bacterial pathogens (e.g., <i>Streptococcus</i> spp., <i>Staphylococcus</i> spp., <i>Listeria</i> spp., <i>Yersinia</i> spp., <i>Shigella</i> spp.) and parasites (e.g., <i>Giardia</i> spp.) in Canada goose feces derived from urban landscapes with the aid of collaborative research laboratories.

<i>Project Title</i> <i>Project Leader</i>	<i>Start Date</i> <i>Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Emerging Technologies to Resolve Human-Wildlife Conflicts: Cell Culture, Repellents, Anti-sweet and Anti-nutrient Agents, <i>Larry Clark</i>	<i>10/1/00</i> <i>9/30/05</i>	To discover new technologies and adapt existing methods for the development of nonlethal repellents and attractants to resolve conflicts between humans and wildlife. Technologies will focus on identifying new, creative methods to screen repellents and enhance their efficacy to reduce crop depredation by birds.	<ul style="list-style-type: none"> • Refine a cell culture method for neurons that mediate perception of primary repellents and characterize the differences and similarities between responses of mammalian and avian model systems to neurochemicals. • Refine collection and culture methods to accommodate the culturing of cells derived from a variety of wildlife species. • Screen biological and chemical agents for their avian-specific anti-sweet properties. • Screen chemical agents for their anti-nutrient properties. • Screen terpenoid compounds for their bird repellent properties. • Develop and evaluate an automated bird hazing system.

Mammal Research

Alternative Capture Systems and Aversive Stimulus Applications For Managing Predation <i>John Shivik</i>	<i>10/1/99</i> <i>9/30/04</i>	Identify, develop, and evaluate advanced capture systems and aversive stimuli applications for predation management emphasizing animal behavior and engineering approaches.	<ul style="list-style-type: none"> • Identify individual response to chemo-mechanical attractants to enable development of advanced capture systems. • Develop and evaluate collar and cable restraint systems for canids. • Develop and evaluate effectiveness of animal-activated frightening devices for canids. • Develop and evaluate animal-activated aversive conditioning collars for predators. • Develop and evaluate auto-attaching radio-collars for selective management of predators. • Develop and evaluate a portable, lightweight, live-capture cage for coyotes.
---	----------------------------------	---	--

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Ecology, Behavior, and Management Methods for Predators to Protect Livestock and Wildlife <i>Russ Mason</i>	10/1/99 9/30/04	Examine ecology, behavior, and management of predators in relation to depredations on livestock, game animals, and threatened and endangered species.	<ul style="list-style-type: none"> Analyze and summarize available data on the effect of coyote removal on population demographics, movements, predation, and other areas of concern to the Wildlife Services program. Examine and describe population ecology and behavior of predators in relation to human concerns, with emphasis on development of a predictive predation management model. Identify and evaluate chemicals that are taste and olfactory attractants for coyotes. Identify and evaluate chemical repellents for coyotes. Determine whether tactile cues (texture, hardness, size, or moisture content) can be used to enhance bait acceptance or delivery system qualities for coyotes. Provide advisory and technical assistance to specialists from other agencies and institutions working with predators and depredation issues.
Holistic Management of Rodents and Other Introduced Vertebrate Pest Species in Hawaii <i>Earl Campbell</i>	10/1/99 9/30/04	Develop safer and more effective methods for reducing rat damage to Hawaiian agricultural crops.	<ul style="list-style-type: none"> Identify, evaluate, and improve methods, materials, and devices to reduce and monitor rodent impacts on Hawaiian crops and natural resources. Develop and test ecologically sound and cost effective integrated pest management plans for reducing rat damage to macadamia orchards and related areas. Assess the economic, ecological, and human health impacts of rat damage and control in agricultural and conservation areas. Assess emerging vertebrate pest and invasive species issues in Hawaii and Pacific Basin areas and develop techniques to manage populations or resource impacts.

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Selective Targeting of Adult Territorial Coyotes to Manage Sheep Depredation: Efficacy and Methods <i>Michael Jaeger</i>	10/1/99 9/30/02	Determine the efficacy of selective removal of adult territorial coyotes whose space overlaps pastured sheep as a strategy to reduce depredation losses, and determine how to selectively target these	<ul style="list-style-type: none"> • Compare the efficacy of two strategies for targeting coyotes on a sheep operation: removing known killers versus indiscriminate removal of only part of the local population. • Determine how territorial adult coyotes respond to broadcasted howling and whether this response can be used to selectively target this class of coyotes for removal. • Determine under field conditions the important variables affecting the rate at which territorial adult coyotes encounter and investigate objects which simulate control. • Evaluate methods for estimating coyote density.
Controlling Wildlife Vectors of Bovine Tuberculosis and Rabies <i>Tom DeLiberto</i>	10/1/00 9/30/05	To study the ecology of wildlife diseases, assess the risk of disease transmission among wildlife, domestic animals, and humans, and develop methods that reduce or eliminate such transmission.	<ul style="list-style-type: none"> • Obtain basic information on bovine tuberculosis and rabies in wildlife reservoirs and vectors. • Develop methods that decrease transmission of bovine tuberculosis and rabies among wildlife, livestock, and humans. • Develop a method to evaluate the effectiveness of management practices on reducing the prevalence of diseases in wildlife. • Produce risk assessments for transmission of bovine TB and rabies among wildlife, livestock and humans.

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Developing Tools and Strategies to Reduce Mammalian Impacts on Forest Resources <i>Date Nolte</i>	10/1/00 9/30/03	Provide feasible nonlethal solutions and improved rodenticides for forest managers to resolve problems encountered with selected wild mammals.	<ul style="list-style-type: none"> • Determine factors impacting forest rodent population densities. • Measure detection and avoidance thresholds to select stimuli for forest rodents and deer. • Develop and improve efficacy of repellents, physical deterrents and frightening devices to reduce wildlife damage to timber and forest resources. • Develop and improve efficacy of baits to reduce populations of rodents detrimental to forest resources. • Develop and improve efficacy of baits to reduce populations of rodents detrimental to forest resources.

Product Development Research Development of Chemistry Based Tools for Wildlife Damage Management <i>John J. Johnston</i>	10/1/99 9/30/04	Adapt and apply chemistry techniques to contribute to understanding chemical and biochemical aspects of wildlife damage to develop solutions for wildlife damage management.	<ul style="list-style-type: none"> • Identification of bioactive compounds in natural products or compounds with existing registrations possessing potential for wildlife damage management. • Develop improved analytical chemistry methodology for the analysis of toxicants, repellents, contraceptives, and attractants (and their residues, degradates and metabolites) that are being pursued as potential chemical wildlife management tools for WS. • Develop chemical formulations to convert active ingredients into efficacious wildlife management tools for WS. • Develop DNA markers to permit the differentiation of individual animals within pest species and possibly differentiation between migrating populations of pest species. • Develop and apply radio-tracer techniques to increase the understanding of the metabolism, residues, degradation pathways, and mode of action for compounds of interest to APHIS.
--	--------------------	--	---

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
<p>Induced Infertility: A Wildlife Management Tool</p> <p><i>Lowell Miller</i></p>	<p>10/1/99 9/30/03</p>	<p>Develop and field test economical and effective agents to control fertility in populations of pest mammalian and avian species.</p>	<ul style="list-style-type: none"> • Identify and evaluate ZP and GnRH immunocontraceptive technologies for controlling the reproduction of deer, coyotes, prairie dogs, and Canada geese. • Develop effective and economical oral infertility agents in pest wildlife species. • Field test different applications of infertility agents on islands, in large fenced-in areas, or in open populations to determine ability to control populations of deer and geese and prairie dogs.
<p>Development and Evaluation of Rodent Damage Management Methods, With Emphasis on Repellents, Barriers and Attractants</p> <p><i>Gary Wiltner</i></p>	<p>10/1/00 9/30/03</p>	<p>Develop new and improved repellent and barrier strategies for damage caused by voles, pocket gophers, rats, and ground squirrels to agricultural crops and property. Develop rodent detection methods/attractants to enhance effectiveness of existing tools.</p>	<ul style="list-style-type: none"> • Develop, test, and evaluate non-lethal methods (repellents, attractants, sensors, barriers, biological control, integrated approaches) to reduce rodent populations and damage. • Assess the efficacy and hazards of rodent population control with rodenticides. • Assess rodent populations and habitat relationships to optimize rodent management in certain damage situations such as in no-till agriculture, alfalfa production, airports, and suburban settings.

<i>Project Title Project Leader</i>	<i>Start Date Projected Completion</i>	<i>Goal</i>	<i>Objectives</i>
Research of Improved Assessment, Sampling and Economic Methods for Wildlife Damage <i>Ray Sterner</i>	10/1/00 9/30/03	Develop and validate new techniques to assess, sample and quantify wildlife damage management activities, plus determine related benefits and costs.	<ul style="list-style-type: none"> Quantify benefits and costs of select wildlife damage management tools (e.g., oral rabies vaccination of wildlife, wildlife reproductive inhibitors, bird-strike control teams) used by WS operations or recently developed by NWRC researchers. Develop less expensive, more rapid techniques for indexing wildlife populations, assessing wildlife damage and determining the effectiveness of wildlife damage management tools/interventions; compare the reliability and validity of variable-area-transect estimators. Develop empirical techniques for valuations of those species reported as causing damage by WS. Develop models and spreadsheets to project the benefits and costs of selected wildlife damage and wildlife damage management intervention.
Development of an Avian Infertility Tool for Application in Goose Management <i>Lowell Miller</i>	10/1/00 9/30/03	Test the effectiveness and develop for use the contraceptive nicalbazin for reproductive control of geese.	<ul style="list-style-type: none"> Evaluate the effectiveness of Nicalbazin to reduce reproduction in Canada geese in laboratory and pen settings. Conduct field efficacy and safety trials with Nicalbazin fed to Canada geese in field settings. Develop long-term delivery systems such as synthetic grit. Cooperate with Koffolk, Inc. to prepare an INAD for goose field research and a NADA for operational use.